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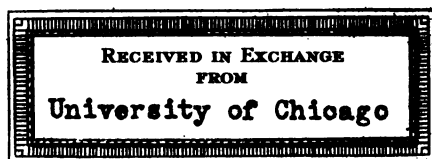
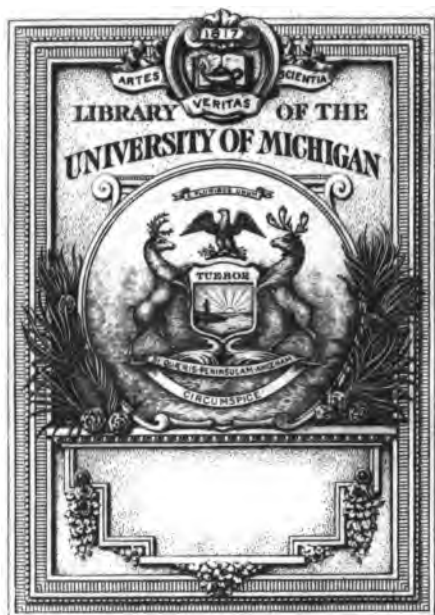
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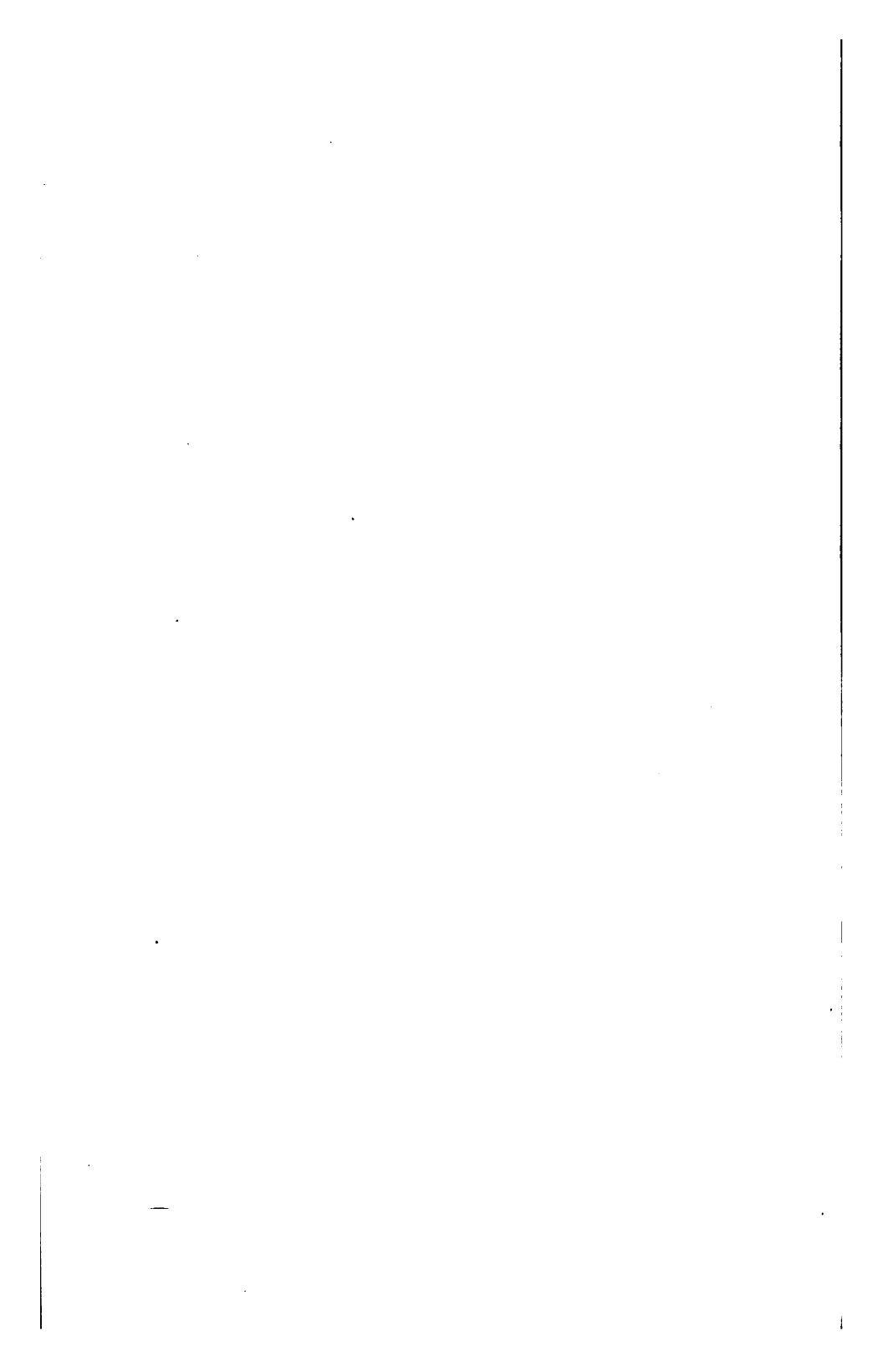
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International Fisheries Exhibition

LONDON, 1883

(228)

NOTES

ON THE

FOOD FISHES AND EDIBLE
MOLLUSCA

OF

NEW SOUTH WALES,
ETC., ETC.

EXHIBITED IN THE NEW SOUTH WALES COURT

BY

E. P. RAMSAY, F.L.S., ETC.

CURATOR OF THE AUSTRALIAN MUSEUM, SYDNEY, FELLOW OF THE ROYAL
ZOOLOGO-BOTANICAL SOCIETY OF VIENNA, COMMISSIONER OF THE
N.S.W. FISHERIES,
HON. COR. MEMB. ROYAL SOCIETY OF TASMANIA.



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LONDON, 1883

NOTES

ON THE

FOOD FISHES AND EDIBLE MOLLUSCA

OF

NEW SOUTH WALES.

12-15-87 H. C. M.
THE greater portion of the exhibits in the New South Wales Court have been liberally supplied by the Trustees of the Australian Museum, at the request of the Commissioners of the New South Wales Fisheries, having been specially prepared by the skilled taxidermists of that institution, the Commissioners themselves undertaking, through their energetic Secretary, Mr. Lindsay Thomson, the preserving of the tinned fish and oysters, and procuring from the various beds the large and interesting collection of oysters displayed in the Court, as well as the fishing-boat, nets, and lines, the fish-oils, the photographs, and oil paintings of the food-fishes, with many other interesting articles mentioned in the Catalogue.

The notes appended to each of the different samples of oysters have been collated from the reports sent with each to the Commissioners by the inspectors and sub-inspectors of the various leased beds in the colony of New South Wales.

H. C. M.

One of the most marked features in the fish-fauna of the Australian Seas is the almost entire absence of the cod tribe (*Gaddidæ*), a family among which the codfish itself, the ling, the haddock, the English whiting, the hake, &c., supply such immense quantities of valuable food, and afford so much employment to thousands of human beings in the Old and New Worlds. This want is, however, amply supplied by members of others families, such as the Mugillidæ, Sciænidæ, and Carangidæ, which visit the Australian shores in vast shoals. From among these, fisheries might be formed, which, if carried on under efficient management, experience, and skill, with a comparatively small expenditure would, in the future, bid fair to rival the largest and most important in the world. Unfortunately there are at present no fish-curing or canning establishments in New South Wales.

With the exception of one species, *Retropinna richardsonii*, Gill, a species not used for food, the Salmonidæ are naturally absent, but this family has been so successfully introduced into the Tasmanian waters, that it is highly probable, ere long, even salmon will form an important article of export.

With regard to the Clupeidæ (the herrings, pilchards, sprats, and anchovies), the species of this family are very numerous, and occur in quite as large shoals as in any other part of the world.

When the Mugilidæ, the most valuable for canning purposes, but which only occur at a certain season of the year, are gone, there are many other families the members of which are also found in immense quantities, for instance, the Sciænidæ: *Sciæna antarctica*, and *Otolithus atelodus*; the Sparidæ: *Chrysophrys australis*, *C. sarba*, *Girella tricuspidata*, *G. simplex*, and *Pagrus unicolor*; the Carangidæ:

Seriola lalandii, *S. gigas*, *S. grandis*, *Temnodon saltator*; the Scombresocidæ: *Hemirhamphus intermedius* and *H. regularis*; the Scombridæ, which include the mackerels: *Scomber australasicus*, *S. colias*, *Thynnus pelamys*; the Trachinidæ: *Sillago ciliata*, *S. maculata*, *S. bassensis*—all of which occur at various seasons of the year, and, being obtainable in large quantities, would afford lucrative employment to hundreds of men, women, and children, and food for thousands.

Moreover, with more experience and knowledge of the proper trawling-grounds, still further sources of supply will arise.

At present, a great difficulty is the proper preservation of fish after their capture for transit inland and elsewhere. This arises from the heat of the climate, the scarcity of ice, and the want of efficiently constructed and swift boats for transit. Doubtless such wants will in due course be remedied, as the demand for fish-food is daily on the increase.

The fishing industry as yet may be regarded as in its infancy. This is shown by the fact that the only nets in general use by the fishermen are the ordinary drawing-seines and mashing-nets, while there is only one style of fishing boat, a model of which is exhibited in the Court.

It may not be out of place here to draw attention to some of the principal features of the New South Wales Court, among which may be enumerated the large sun-fish, *Orthogoriscus*, sp., the Luth, *Dermatochelys coriaceus*, the group of Péron's Seals, *Otaria cinerea*, exhibited for the first time in England and Europe, the large collection of food-fishes, stuffed and in spirits. The sponges and oysters deserve attention, while the walls are decorated by life-sized oil-paintings of fishes and large photographs of the

fish-markets and certain of the Government offices and other magnificent buildings, highly creditable to Mr. James Barnet, the colonial architect.

As preliminary to the list of objects exhibited, notes of the chief families of Australian food-fishes, &c., have been introduced, as follows:—

BERYCIDÆ.

This family affords us with but one useful food-fish, *Beryx affinis*, known among the fishermen of Port Jackson as the "Nannagai," or, as it is sometimes spelt, "Nannygy." It is a most delicious fish, always brings a high price, but is seldom found in sufficient numbers to form a regular supply. It is a deep-water fish, but enters the harbours during the summer months to spawn in small troops, and is then found on the sandy flats near reefs in comparatively shallow water, where it is usually taken with the hook and line. It is more plentiful along the coast, frequenting the Schnapper grounds, and is there taken in larger numbers. Future search will probably be rewarded by finding its winter-quarters, or localities where it is more plentiful, from which a regular supply can be obtained.

It is a beautiful fish, of a bright deep red colour. Very young specimens are sometimes taken in the dredge and trawl, ample proof of its breeding in Port Jackson. Recently, Mr. Johnstone, of Hobart, has reported it from Tasmania—a curious fact, as formerly this genus was supposed to be confined to warmer waters and not to extend beyond the semitropical zone.

PERCIDÆ.

Among the Percidæ, a family largely represented in Australia, there are but few species which occur in large

shoals. The "Salmon" of our fishermen, *Arripis salar* (*A. truttaceus*, C. et V.), is one of the most important. It occurs at all seasons on our coast; and during the summer months it enters the harbours, bays, and estuaries in immense shoals, probably to spawn, some going up the rivers into the brackish water. They attain a great size; and, when in pursuit of their prey, take prodigious leaps out of the water; they afford good sport to the amateur fisherman, but the supply for market is usually taken with the seine. It is a beautifully marked fish, especially when young, and in weight up to 2 or 3 lbs.; it is known as the salmon trout; but being one of the most common fish in the southern market, it is not so highly appreciated as it deserves. If properly treated, after the manner of the cod and ling, it would form just as palatable an article of food; and, from its large size and the prodigious numbers in which it congregates, it is capable of affording a large quantity of valuable food either for home consumption or export.

Enoplosus armatus, a beautiful and grotesquely marked fish, with large and curiously developed fins, is another species worthy of mention. Although a delicious fish, from its small size it is not much sought after. It is usually plentiful in the harbours at all seasons of the year, frequenting the rocky shores and small open patches among the weeds in troops of from ten to fifty in number. It is occasionally taken in the seine or in "set" nets with other rock-fish (*Labridæ*, &c.).

The trumpeter perch (*Therapon cuvieri*), was formerly very numerous in Port Jackson, and occasionally taken in immense quantities. It is a small, delicious fish, and prettily striped along the body. It seldom exceeds eight inches in length, and takes the bait readily. When caught

it emits a "tooting" note, not unlike that emitted when dying by some of the Siluridæ (*Arius australis*); hence its local name of "trumpeter." Like *Enoplosus armatus*, it is not a migratory fish, and may be found in the harbour of Port Jackson all the year round in small quantities.

Another valuable food-fish belonging to this family is *Serranus damelii*, the Black Rock-Cod. This fish was formerly plentiful, but now not so abundant in Port Jackson; to the northward, however, of our harbour it is still found in considerable numbers, and attains to a large size, sometimes weighing more than 20 lbs. The following is an extract from the report of the Royal Commission on the Fisheries of New South Wales, 1880, p. 10:—

"The genus *Serranus* comprises most of the fishes known as 'Rock Cod.' There are many species of it in these seas, and the number increases in the warmer latitudes of the north, but one only is sufficiently useful as an article of food to merit notice, and that is the 'Black Rock-Cod' (*Serranus damelii*, Günther)." "It is found on all the rocky parts of the coast, and in the harbours about bold headlands. It takes the bait readily, and is seldom captured by the net. It attains a great size, fishes weighing 35 and even 40 lbs. being not uncommon. It is found as far as Jarvis Bay to the south; to the north it has probably a much more extended range. It has been observed of this fish that those caught off the 'Solitaires' and other places to the north of Port Jackson are, as a rule, of larger size than those found to the south. It is rarely seen now in the Sydney market, owing to the great falling-off in the supply obtained from Port Jackson Heads, Coogee, and other places where it was formerly abundant. It is difficult to account for this falling-off in the supply; for the causes which undoubtedly affect the supply of other fishes do not apply to this. The spawn is not deposited in shallow bays constantly raked by nets, the young are never taken in the seine, and the number of the adult fish captured has never been sufficient to account for the deficiency. It is probable that

the fish has merely sought retreats further removed from the stir and traffic of Port Jackson."

Although the fact of an abundance of this valuable food-fish being found further north on our coasts must be well known to most of our fishermen, it is curious that it is so scarce in our markets. But this is probably due to the absence of fast steam-carriers ; and this drawback is likely to continue until we have two or three fast steamers, fitted-up with ice-compartments, to ply round our shores and pick up and bring to market the various takes from the fishing-boats.

Another good table-fish is the "bull's-eye," a beautiful salmon-red fish with small scales, known as *Priacanthus macracanthus* (C. et V.). At times it enters the harbours in considerable numbers ; but the supply is irregular.

Another of the Percidæ, *Plectropoma ocellatum*, the Wirrah of the fishermen, is more plentiful. It is when first caught a handsome fish, of a pale olive-brown or olive-green colour, with numerous bright blue dots on spots of a lighter tint. It is not considered a good table-fish, probably because few know how to cook it.

A more important fish, but one which we know very little about, is a fine perch-shaped *Glaucosoma*, which has been named *Glaucosoma scapulare*, on account of the peculiar development of the suprascapular bone, which protrudes through the skin to the length of more than an inch. This fish was formerly not scarce on our coasts, but is now seldom obtained, perhaps from its frequenting very deep water. Occasionally specimens are obtained in Schnapper fishing ; they attain a large size, reaching to 8 lb. weight, and are known as the sea-bream.

The perch (*Lates colonorum*), the "Murray cod," and

other members of the Percidæ form important articles of food, some of which will be considered under our fresh-water fishes.

GERRIDÆ.

Gerres ovatus, a small but delicious fish, known to the fishermen as "silver bream," "silver bellies," &c., is often taken in great numbers at certain seasons; it seldom reaches 8 inches in length, and appears to enter the harbour of Port Jackson in July. It is a handsome fish, of a bright silvery hue, with a silver-blue tint on the upper portion of the body. The flesh is rather soft, probably from the species being one that does not keep well; nevertheless it is of good flavour.

MULLIDÆ.

This family supplies us with two or three species of very delicious fishes, known as red mullets. They are usually taken at night in the seine and trawl, but seldom in sufficient numbers to warrant them being classed among our useful fishes. The largest species is *Eupeneus porosus*, a very beautiful fish, of an orange- or vermilion-red, with yellow streaks and blue and violet markings and spots. It reaches to 12 inches in length.

SPARIDÆ.

This family furnishes some of the most important of our food-fishes, and from it comes our chief supply. The carnivorous Sparidæ include the Schnapper, *Pagrus unicolor*, the immature young of which are known respectively as the "squire" and red bream. It is a highly-coloured species, of a rich pink or red colour, with blue iridescent spots on the scales.

The following extract is taken from the Report of the Royal Commission (pp. 12-13) before mentioned :—

“ The Schnapper (*Pagrus unicolor*) is the most valuable of Australian fishes, not for its excellence, for we have many more delicious,* but for the abundant and regular supply which it affords of a very nutritious and wholesome description of food. It is found on all parts of the Australian coast, but most abundantly on that of New South Wales. It is a deep-water fish, found generally on or near rocky points, or reefs running out for miles from the coast. Its food is chiefly the mollusca living on the rocks, though the readiness with which it will snap up bait of the most varied descriptions indicates tastes of rather an omnivorous character. Like all or most fishes, it has its periods of migration and accumulation in shoals, a movement so well expressed by the term ‘schooling’ that we shall adopt the phrase for the future. The time of the appearance of the ‘School Schnapper’ is the early part of summer; it is then believed to be at least three years old; the previous stages of its existence being well known under the names of ‘Red Bream’ at the age of one year, and of ‘Squire’ at two. At a still greater age the Schnapper seems to cease to school, and becomes what is known as the ‘Native’ and ‘Rock Native,’ a solitary and sometimes enormously large fish.” “At the first appearance of the school-fish in early summer the roes are small; but the full size is attained in or about January, about which time no doubt the spawn is deposited. The actual mode of the deposition or attachment of the spawn has never been observed, and the same may be said of the date of the first appearance of the young fry, but there can be little doubt that the deposition takes place in moderately deep water near the land, and that the young are probably hatched before the winter season. The young fish, in the shape of ‘Red Bream,’ are abundant in the harbours and inlets, but are seldom captured in large quantities in the seine; they take the hook, however, freely, and the capture of them is a very favourite pastime of the

* [This is a matter of opinion; many assert that there is no better fish in the Australian waters than a half-grown Schnapper.—E. P. R.]

Sydney people. The Schnapper is generally caught by the hook, but instances have been known of their capture in Lake Macquarie and other places by means of very deep nets."

The black bream (*Chrysophrys australis*) and the tarwhine (*Ch. hasta*) are both valuable food-fish, which form a regular supply; they attain a weight of 4 to 5 lbs., and always meet with a ready sale, although the tarwhine is said not to keep so well as the black bream.

Among the herbivorous Sparidæ the blackfish, under which name several species of *Girella* are known, give us a regular and palatable supply of good food. These are taken in large quantities with the seine, and sometimes by amateurs with a line and hook baited with green seaweed.

Girella tricuspidata, *G. simplex*, and *G. ramsayi* are the species chiefly found in the market, and most esteemed. *Haplodactylus lophodon* and *H. obscurus*, belonging to the same section, do not furnish a regular supply; the latter, known to our southern fishermen as the "butterfish," is highly esteemed.

SQUAMIPINNES.

The "sweep," *Scorpus æquipinnis*, is the only fish of this family that is used with us as an article of food, or found in sufficient numbers to be of any market value. "It is not much thought of, yet at times it is brought to market in considerable quantities, and finds consumers at fair prices. The schooling-season is midsummer, and the spawn is probably deposited in the harbour, as the young sweeps are frequently caught in the seine."

It is occasionally taken in line-fishing, and, although not so good as the black bream and others, is by no means a bad table fish.

CIRRHITIDÆ.

One of the most important families, supplying a large amount of valuable and delicious food. Among the best are the trumpeters (*Latris*), of which there are several species, chiefly frequenting our southern coasts. The hobart trumpeter (*L. hecateia*) is one obtained in large quantities, and in a smoked and dried state forms an article of export from Tasmania to the other colonies. *Latris hecateia* is not often found on the New South Wales coast, but *L. forsteri* occasionally finds its way into the market, and is considered a delicacy. The Morwongs—*Chilodactylus macropterus*, *C. morwong* (sp. nov.), and *C. fuscus*—are more plentiful, and find a ready sale. *C. vittatus* is occasionally taken in the seine, but is considered rare; it seldom attains a foot in length, and, like *C. fuscus*, is a handsomely marked fish. Some interesting and valuable information on these fishes will be found in the Report of the Royal Commission on Tasmanian Fishes, 1883.

TRIGLIDÆ AND COTTINA.

“The Australian species which can be classed as edible are the ‘Red Rock-Cod,’ four species; the ‘Flatheads,’ four species; and the ‘Flying Gurnets,’ three species. The ‘Red Rock-Cod’—*Sebastes percoides* and *Scorpena cardinalis*, *cruenta*, and *bynoensis*—are rock- and ground-fish, and readily take the hook.” “The ‘Flatheads’ of the coast are *Platycephalus fuscus*, *levigatus*, *basensis*, and *cirronasus*: of these the first, *P. fuscus*, is the Flathead best known and most common in Port Jackson. All the species are of excellent quality, and may be ranked among the best of our fishes. Like the Red Rock-Cod, the Flathead is a ground-fish, but is found on a sandy bottom only, and generally at only a moderate depth. It is taken both by the hook and net. But little information is obtainable about the history of the Flathead;

but it seems to come into this harbour full of spawn in mid-summer, and probably deposits its ova on the sandy banks in tolerably deep water. It is probable that the trawl-net will be found of most service in reaching the haunts of this very useful fish, which only requires to be better known to be better appreciated.* The 'Flying Gurnets'—*Trigla kuma* and *polyommata*, and *Lepidotrigla papilio*—are very beautiful and excellent fishes, but very rare and uncertain in their movements. All we know of them is that they are deep-sea fishes, appearing, when they do appear, only in summer." Two species at least breed in Port Jackson, the young being frequently seen in shallow water.—R. R. Com., pp. 16, 17.

TRACHINIDÆ.

The Whittings, *Sillago*, are perhaps the most highly prized of all the Australian food-fishes. Four or five species frequent our coasts; but the principal, and the species most common in our markets, are the "sand-whiting," *Sillago maculata*, and the trumpeter whiting, *Sillago ciliata*. The latter is perhaps the more common, and grows to a larger size than the former. They are taken in considerable numbers during the summer months, and all through the year; but after having deposited their spawn are not considered in season until they have recovered from this arduous duty. Although occasionally met with in the deep waters of the bays, and sometimes taken with the line, the supply comes from the sandy shallow flats which they usually frequent, being secured with the seine, and with the trawl the writer has also

* Since the above was written the "Otter" trawl has been used, with more or less success, in the harbour; there can be no doubt that, by trawling, large numbers of these useful fishes could be obtained in suitable places along the coast and in the numerous shallow bays and inlets.

secured many fine fish. A curious habit of both species (*Sillago maculata* and *S. ciliata*) is perhaps worth mentioning—when, finding themselves enclosed by the seine, they burrow in the sand sufficiently deep to allow the nets to pass over them. My informant, Mr. W. Brown, assures me that, after the drawing up of the seine, he has taken two or three dozen fine fish from the sand, feeling them with the feet at first, and then simply securing them with the hand ; this is probably the origin of the local name of “sand-whiting.” The following are extracts from the Report of the Royal Commission, p. 18:—

“There are in all four Australian species. The Common Sand-Whiting, *Sillago maculata*, abundant on the New South Wales coast ; the Trumpeter Whiting, *Sillago bassensis*, also abundant here ; and the most common species in Brisbane is *Sillago punctata*, the Whiting of Melbourne, and rare on this coast.” “The first of these, the ‘Sand-Whiting,’ is by far the most important as an article of food. It is perhaps in more general use even than the Schnapper, constituting almost all through the year the most generally used breakfast fish we have. Of its excellent quality, when in good condition and in the proper season, there cannot be a doubt ; but the great favour in which it is held induces, we fear, its extensive use at times when it ceases to be good, and may probably be unwholesome. It is in best condition when it first appears to come in from the sea, about the middle or latter end of summer. It is then a large clean fish, with the roe formed but not full-sized, and it continues in its excellent condition until the roe has attained full maturity or been shed. This occurs generally about March or April. The actual deposition of the spawn has never been observed, but there cannot be a doubt that the sandy and muddy beaches of bays and lakes are the favoured spots. There is a similar want of reliable evidence as to the time of the appearance of the young fry ; but we believe that there are sufficient grounds for concluding that the spawn deposited at the end of summer does not germinate until the warmth of spring.

... is grown short of the
... harbours, estuaries, and
... their departure to the sea;
... nursery that the most
... fishermen. The age
... to the sea have not
... always in considerable
... and though they are
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... such request as the
... The time of arrival
... later than the Sand-
... other respects."
... Australian waters,
... for food or

... is the Jew-fish
... a large size, ex-
... men may be seen
... New South Wales
... a ready sale, but
... coarse. Our 'Report'

... by fishmongers and
... is found at almost all
... It is a deep-sea fish,
... specimens may be
... It has been more than
... *Setoena aquila*, the
... of the Mediterranean;
... describing our Jew-fish as
... some doubt on the
... genus of fishes is of great

value for isinglass, and forms a valuable article of export on the Indian and Malacca coasts, the merely dried bladder being worth equal to 1s. 6d. per lb. In one of our species—the Teraglin—the air-bladder is of great size and excellent quality, and treated in the same way, that is without any preparation or outlay except that of drying in the sun, would probably add threepence to the value of each fish caught.”—R. R. C., p. 20.

The Teraglin (*Otolithus atelodus*), another allied fish of the same family, is in many respects very like the Jew-fish, but does not grow to such a large size, and the flesh is of a finer grain. Like the Jew-fish, it is one of our principal food-fishes, and occurs all the year round, but is more plentiful during the warmer months. Fine specimens of this fish are exhibited in Case No. 3.

POLYNEMIDÆ.

Although three species of this family have occasionally been found on our coast, they cannot be enumerated among our useful fish, being great rarities. Further north, however, in the warmer waters of the Queensland coast, one species of *Polynemus* at least is common, being found plentiful at the mouth of the Burdekin river by one of the employés of the Australian Museum, Mr. A. Morton.

SPHYRÆNIDÆ.

“There are three fishes belonging to this small family occasionally found in Port Jackson and the other inlets of the coast. They are *Sphyræna novæ hollandiæ* and *obtusata* and *Neosphyræna multiradiata*, all of them named, from the elongate muzzle and strong teeth, ‘pike,’ though in no way related to the well-known European fish of that name. They are very good for the table, but are so seldom brought to the market in any quantity that they are but little known. They are only caught in the seine, and

though occasionally taken at other seasons, are most abundant in summer, when they seem to come in from the sea in small shoals."—R. R. C., p. 21.

TRICHIURIDÆ.

The barracouta (*Thyrsites atun*) and the Tasmanian king-fish (*T. solandri*) are the two principal members of this family that find their way to the markets. The former is the most common, but the latter also occasionally occurs in great shoals. After an absence of several years, shoals of *Thyrsites solandri* have again visited the Tasmanian coasts. *T. atun* is not so erratic in its movements, and consequently the supply is regular; and when smoked and dried, or salted, forms an article of export to the other colonies. They are large fishes, attaining a length of four feet, and 4 or 5 inches in diameter. Individuals occasionally wander as far north as New South Wales; but the Tasmanian and southern coasts are the homes of these species.

SCOMBRIDÆ.

"This is a very large family, comprising four or five groups of fishes of very different appearance and habit. We will deal with the most numerous, and certainly the most typical, of the groups first, the Scombrina. The genus *Scomber* is represented in Australia by two species, *Scomber australasicus*, Cuv. & Val., and *Scomber antarcticus*, Castelnau. The last-named is the one best-known in these seas as the 'Mackerel.' Like all, or almost all of the 'Scombrina,' it is a gregarious and exceedingly predacious fish, rejoicing in the open sea and generally near the surface, and apparently constantly in pursuit of shoals of other fishes. The instinct which in all fishes seems to compel them to mass together and approach the shore at the season of spawning is not wanting in the Mackerel, and it is probable that the occasional visits of more than

usually large shoals of these fishes is due to this annual movement ; at the same time their frequent appearance in Port Jackson at un-anticipated times may be owing to the appearance of shoals of other fish which they may have followed up. Be that as it may, it is certain that about midsummer, annually, shoals of enormous magnitude pass near the coast, going apparently in a northerly direction ; that the sea has, sometimes for miles, the appearance of being almost a solid mass of them ; and that they also have their enemies, and are followed and devoured by shoals of larger fish of their own family if not species, as well as by hosts of other predacious fishes, birds, and mammals. The Mackerel which appear so frequently in Port Jackson, and afford such excellent holiday fishing to the citizens of Sydney, are generally very young, and it is said to be rare indeed to get an adult or full-roed specimen. It is a very good fish when eaten fresh, but, like all the Scombroid fishes, it dies immediately after leaving the water, and decomposes very rapidly, and when eaten in that state it has been known to produce symptoms of fish-poisoning : a most unjustifiable prejudice has been excited against this fish in consequence.

“ The ‘ Bonito ’ (*Thynnus pelamys*) is also seen occasionally in these seas. It is generally observed in pursuit of shoals of other fish, and it seems to wander about in large shoals, but whether in search of prey or for spawning purposes there is no evidence to show. Another very fine fish—the King-fish of the West Indies, not of Port Jackson—*Elacate nigra*, is also occasionally got here ; but it can scarcely be looked upon as more than a chance visitor. There are several other Scombroid fishes on the coast of the same predacious character, and all more or less good for food, but they are essentially ocean fishes, and only enter our harbours when in pursuit of shoals. They belong to the genera *Auxis* and *Cybius*. The ‘ Pilot-fish ’ (*Naucratus ductor*) is also a member of this group.”—R. R. C., p. 22.

Dr. Steindachner, one of the greatest authorities, is of opinion that our mackerel, *Scomber antarcticus* of Castelnau, is identical with the European species, *Scomber colias* of Linn.

CYTTIDÆ.

Under this family we may mention the John Dorey (*Zeus australis*), considered by some to be the same as the European fish of the same name, *Z. faber*, Linn. This is one of our very best food fishes, always in demand, and bringing a high price in the markets, sometimes as much as 1s. per pound; but the supply is so irregular that it can only be looked upon as a rare delicacy. It enters the harbours from the sea to spawn during summer, and frequents the sandy bottoms near reefs. It is only occasionally taken in the seine, but is more often captured by line-fishing with a live bait. When we know more about our coast-line this fish will probably be found in numbers, frequenting the rocky and sandy bottoms adjacent to Port Jackson.

Another member of this family (*Cyttis australis*) takes the place of the John Dorey in the southern markets.

CARANGIDÆ.

This important family supplies us with large quantities of delicious food-fishes, many of which, from their large size, are not so appreciated as they deserve.

The white trevally, *Caranx georgianus*, which on the New South Wales coast is seldom taken weighing over 1½ to 2 lbs., is found on the shores of Queensland of a much greater size, not unfrequently reaching 5 to 6 lbs., and affords fine sport to line-fishers; it is also taken with the seine in large quantities. The bait used in line-fishing is a blue-bodied crab (*Mycteris*, sp.) Very young fish are sometimes taken in the trawl and seine in Port Jackson.

The yellow-tail, *Caranx declivis*, of Richardson, now generally admitted to be the young of *Trachurus tra-*

churus, is very abundant in all parts of the harbour; it is always in demand for bait, but is also a good edible species. Adults, reaching a length of 15 inches, are occasionally taken on the coast, and sometimes also far up the harbour during the spawning season.

"There are very many species in Australian waters, their numbers increasing rapidly towards the warmer seas of the north. Those best known to the fishermen of Port Jackson are—the 'Yellow-tail' (*Trachurus declivis*), the 'White Trevally' (*Caranx georgianus*), the 'King-fish' (*Seriola lalandii*), the 'Samson-fish' (*Seriola gigas*, Gth.), and 'The Tailor' (*Temnodon saltator*). The first of these, the 'Yellow-tail,' is almost, if not quite, identical with the 'Horse Mackerel' of Europe (*Trachurus trachurus*). In the young state it is abundant at all times in Port Jackson, and is in great demand for bait. The adult fish is seldom seen in the harbour, but it is said to pass along the coast in large shoals at or about midsummer. It is most probable that this fish spawns in the inlets and harbours of the coast, from the fact that the young fish of from five to six inches in length are always to be found in such localities. The very young fry have a most extraordinary and ingenious way of providing for their safety and nutrition at the same time; they take up their quarters inside the umbrella of the large *medusæ*, where they are safe from their enemies, and are, without any exertion on their part, supplied with the minute organisms which constitute their food, by the constant current kept up by the action of the curtain-looking *cilia* of the animal."—R. R. C., pp. 24, 25.

"The 'White Trevally' is very abundant at times in the harbours and inlets of the coast, but generally in a young state. The adult fish is large, and appears in summer in very large shoals.

"The 'King-fish' is about the most voracious and destructive of all the predacious fishes of these seas. It grows to a large size, congregates in enormous shoals, and habitually pursues and destroys the shoals of other fish at all smaller than itself. It is not considered a very good fish.

"Of the 'Samson-fish' very little has been observed. It is a

large and handsome fish, and affords good sport to the amateur fisherman.

"The 'Tailor,' is well known in Port Jackson. The young fish are constantly making their appearance in shoals in the summer season, and are taken in the seines in great numbers. They are much in demand for bait, but are not a favourite catch for the fishermen, as they are most destructive to the nets. The adult fish are large, and are known in the Melbourne market by the name of 'skip-jack.' They school in midsummer, move in enormous shoals, and are said to be most destructive to the young and spawn of other fishes. As an article of food they are not in much request, but when fresh there are few more delicate and well-tasted fish." —R. R. C., pp. 25, 26.

Neptomenus travale and *N. brama* are good food-fish, but rare in Port Jackson. To the south, however, they are more common, and reach to a considerable size, weighing from 5 to 10 lbs.

MUGILIDÆ.

"A very wide-spread and valuable group of fishes, amply represented in Australian waters. The best-known species in New South Wales are the 'Sea-Mullet' (*Mugil grandis*, Castelnau); the 'Flat-tail Mullet' (*Mugil peronii*, Cuv. & Val.); the 'River' or 'Hard-gut Mullet' (*Mugil dobula*, Günther); and the 'Sand-Mullet' or 'Talleygalann' (*Myxus elongatus*, Günther). There are other species, such as *Mugil cephalotus*, *petardi*, *compressus*, *argenteus*, and *acutus*; but they are rarely seen and little known, and not therefore classifiable as useful fishes. The first of this list, the Sea-Mullet, is a large fish attaining when full grown a length of 2 feet. It is unsurpassed in richness and delicacy of flavour by any fish in the world, the Salmon not excepted; and it offers itself for our use in countless numbers at the very season when it is in the best possible condition. The history of this fish is now pretty well known, though it will be seen by a perusal of the large amount of evidence printed in the Appendix, that there are many very conflicting statements and opinions given."

"To begin with the spawning season:—In the latter end of summer, that is at periods varying from the middle of March to the middle of May, the Sea-Mullet is seen to enter all the harbours and inlets of the coast in successive shoals, some of the most astonishing vastness. It is then full of roe, and in splendid condition. When not interfered with by fishermen (for it is a fish easily turned from its course) or diverted by storms or floods, these shoals penetrate to all parts of these inlets, and run up the rivers even into fresh water in search of suitable places for the deposition of their spawn. When a suitable spot is reached, the deposition of the spawn commences; and the process is carried on in much the same way as that of the Salmon and other fish of similar habits. Sometimes, however, from bad weather or the persecution of fishermen, the shoals are prevented from seeking suitable spawning grounds, and the fish, being no longer able to retain the spawn, shed it loose upon the water, where it becomes entirely lost. When the ova are properly fertilised and left undisturbed the young fish make their appearance on the approach of warm weather in spring (Macleay), when they may be seen in large shoals close to the land and in shallow water. From that period until they become adult, which is probably at the age of two years, they seem to keep entirely to the rivers, lakes, and mud-flats, where they thrive and grow with amazing rapidity. As they are without teeth, they are incapable of eating either animal or vegetable substances in the ordinary sense of the term; but they are possessed, Dr. Günther informs us, of a pharyngeal apparatus which sifts the organic from the inorganic particles from the mud which they swallow and on which they live. When the period at length arrives for the mature fish to go to the sea preparatory to spawning, the instinct which actuates them seems to be irresistible. In one instance, some years ago, when Tugerrah-beach lake was for a time shut up at its sea-mouth, the Mullet pressed in such masses in the direction in which the outlet should have been that thousands of them were forced up on the land and perished. An occurrence of the same kind is mentioned as having happened at Lake Illawaira under similar circumstances. It is doubtful how long it is between the rush of the fish to the

sea and their re-entrance into the same or other rivers ; the belief is that the time is very short, that the movement is only from one opening of the coast to another, and always from south to north. There can be little doubt that the fish, after spawning, find their way back to their old haunts ; but they have very seldom been seen so returning. The spent fish are for a time unfit for food, but they improve in condition very rapidly. The only instrument of capture used for the Mullet is the seine-net. The range of the species is from the Gippsland lakes on the south up to Brisbane on the north." The weight of a full-grown sea-mullet is from 6 to 8 lb., sometimes more. If preserved and tinned, this fish would form a valuable article for export as well as for home consumption. It is much to be regretted that no tinning establishment exists in Australia, and too often this fine fish is taken solely for its oil and roe ; the latter, slightly smoked and dried, is considered a great delicacy.

"The Flat-tail Mullet is also a very good fish, but has neither the size nor the extreme excellence of the Sea-Mullet. It appears also at the end of summer or beginning of winter, and spawns in our bays and creeks ; but the shoals are never of the same enormous size as are common with the other.

"The other species (*M. dobula*) is, except at the schooling season, almost a freshwater fish, living as high up the streams as it can get ; but it cannot, like the European salmon, pass up rapids or falls. It is a good fish, but inferior to both the others. The term 'Hard-gut Mullet' is sometimes applied to this species, but more frequently the fishermen apply that name to immature specimens of the 'Sea-Mullet.' It is sometimes taken by the hook.

"The 'Sand-Mullet' (*Myxus elongatus*) seldom exceeds seven or eight inches in length ; and though no doubt excellent eating, as are all the family, is looked upon as too small for the market."—*R. R. Com.*, pp. 27-30.

LABRIDÆ.

The most important of this group is the blue groper (*Cossyphus gouldii*), a valuable and delicious fish, attaining a large size, and often 20 to 30 lbs. in weight. The head

and shoulders of this fish, says our Report, "makes the most delicious dish one can conceive." Half-grown fish are usually taken in the seine, the adults by line-fishing, or with the trammel-net set near the rocks.

Another common species is the "Maori" (*Coris lineolatus*), a most varied and beautifully marked fish, of a rich vermilion, longitudinally banded with broad bands of dark violet and pink, and elegantly ornamented with bright blue lines on the head. It frequents the rocky shores and weeds, among which the young fish take refuge. *Labrichthys laticlavus* is sometimes obtained. *Odax semifasciatus* known locally as the "rock-whiting," "stranger," &c., is more often found. Other members of the Labridæ occasionally are taken, but do not afford any supply worthy of mention. The same may be said of the "pig-fish" (*Cossyphus unimaculatus*), which is frequently seen; it is a bright-coloured fish, of a rich red, with a blackish spot about the centre of the dorsal fin, and occasionally two black longitudinal markings on the side of the body.

GADIDÆ.

This family, so largely represented in the Northern hemisphere, is almost wanting in the Australian seas. It is represented by only three or four species, which may be looked upon as food-fish, belonging to the genera *Lotella* and *Pseudophycis*. *Lotella grandis* is the largest species, and not usually found. *L. callarias* and *L. rubiginosa*, known as the beardie and the ling, are the only other species which are marketable, and even these are only occasionally found. *L. callarias* and *L. grandis* are delicious food-fish, but require to be cooked while fresh, soon decomposing after death.

PLEURONECTIDÆ.

Although we have no less than ten species of flat-fish inhabiting Port Jackson, the supply is meagre and uncertain ; in fact, the only species which afford us articles of food are *Pseudo-rhombus russellii*, *P. multimaculatus*, *Arnoglossus bleekeri*, all of which are known locally as flounders, and the sole (*Synaptura nigra*, Macleay). The former are tolerably good fish ; the latter is a great delicacy, far superior to any sole, brill, or flounder that comes into the English market. Having recently made the experiment, I may be permitted to speak confidently on this subject. Two other very delicious fishes, although found only during the summer months, are *Solea macleayana* and *S. microcephala*. The latter is seldom met with in any quantity ; the former, only lately discovered, inhabits also the freshwater streams. Two other species, *Lophonectes*, sp. n., and *Tapirisoletta*, sp., have been recently brought up by the trawl. It is not unlikely, when trawling is resorted to in the waters of Port Jackson and the adjacent coast, that we shall have a regular supply of the most delicious food-fish. It may interest the naturalist to know that the following species frequent the harbour of Port Jackson :—*Pseudo-rhombus russellii*, *P. multimaculatus*, *Tapirisoletta*, sp., *Arnoglossus bleekeri*, *Tetrorhombus excisiceps*, *Synaptura nigra*, *Solea macleayana*, *S. microcephalus*, *Lophonectes* 2 sp., *Pardachirus pavoninus*, *Plagusia unicolor*. The last-named is known under the name of the lemon sole ; it is of a pale olive-yellow when alive. To the southward are found *Rhombosolea monopus* and *Ammotretis rostratus*, both good table-fish.

The flounders in Port Jackson are occasionally taken in the seine, and sometimes in the trammel-net when set

across a sandy spit as the tide is falling, out usually with the hook and line, small prawns or shrimps being the baits used. The soles (*Synaptura nigra*) do not take the bait ; and although a few may occasionally be taken in the seine, the usual mode is by spearing them. On a clear calm morning the fisherman allows his boat to drift with the tide, or poles it along with his spear over the shallow sandy flats on which these fish abound or frequent to spawn. A practised eye will soon discern the shape or outline of the fish covered in the sand, with usually only its eyes exposed. When disturbed, and as it settles down again in the sand, a slight cloud is thrown up, which indicates its whereabouts. The fish is easily speared, and several dozen may be obtained in two or three hours or less time.

Recently, by trawling, many individuals, both of flounders, soles, and other flat-fish have been obtained. The colours of these fish vary in accordance with the colour of the ground they frequent ; some are of a light olive or ashy brown from a sandy bottom ; others of a jet-black colour when taken off the mud.

SILURIDÆ.

In Australia many species of this family abound, the most common being *Cnidoglanis megastoma*, found on all the muddy flats in the harbours in the neighbourhood of Port Jackson. It is generally brought up in the trawl, but approaches the shore more often at night, when it is frequently taken in the seine. It is seldom brought to market, Europeans having an undue prejudice against eating it.

Another species, *Copidoglanis tandanus*, is plentiful in

the rivers, and will be noticed under our Freshwater Fishes. Both are rich and good-flavoured food-fishes.

SCOPELIDÆ.

This family affords us but three species, one only being worthy of mention; the others, of the genera *Saurus* and *Saurida*, must be looked upon as comparatively scarce fish. The "Sergeant Baker," *Aulopus purpurissatus*, is the species usually found in the market, and by some considered a delicacy. In taste and grain the flesh resembles the English whiting, but has a much better flavour, if the latter can be said to have any flavour at all. It attains the length of 18 inches, and is a highly coloured and beautifully marked fish, of a deep red hue; the fins opalescent and strongly marked with deep red spots and blotches; the flesh is white, large in grain, and rather dry. It is occasionally taken in the seine, but more often in deep water with the hook and line.

SCOMBRESOCIDÆ.

Five or six species of this family frequent the harbour of Port Jackson and coast-line of New South Wales, but only three of them deserve notice. The most common are the two species of gar-fish—*Hemirhamphus intermedius* (the sea gar-fish), and *H. regularis* (known as the river gar-fish). The former (*H. intermedius*) comes in from the sea in immense shoals, is a universal favourite with all classes; no breakfast table should be furnished without it. The other, *H. regularis*, is similar in every respect, but by some considered the better fish. The flesh of both, before cooking, is semitransparent, with a silver stripe along the lateral line; when cooked it is as white as snow, and of the

most delicious flavour, having no bones of any size but the back series; it may be eaten without that attention which is due to other fish in this respect. The following extract is from the Report of the Commissioners:—

“The ordinary Sydney Gar-fish comes in from the sea in the latter end of summer, to deposit its spawn in suitable spots in the harbour. It is then in the finest condition, and makes its appearance in successive shoals, some of them of enormous size. During the latter end of February of this year (1880) the shoals were so large that several boat-loads were taken in one haul of the seine, and the fish on the spot could be purchased for *sixpence a bushel*. The ‘Long Tom’ (*Belone ferox*) is also of this family; it is a good fish, but not so fashionable as the Gar-fish, and, like it, is taken only in the net.”—*R. R. Com.*, pp. 33, 34.

Other species, as *H. commersoni*, *H. argenteus*, are rare with us, and recently *Scomberesox forsteri* has been taken in Port Jackson. *Belone ferox*, the “Long Tom” of the fishermen, “green-bone,” and “gar-fish” of Europeans, is also a good table-fish; it is seldom taken with the line, but at times in considerable number with the seine. It reaches the length of 4 feet, but is usually found about $2\frac{1}{2}$ to 3 feet long; it has not the delicate flavour of the gar-fishes (*Hemirhamphus*). There are three or four species of *Belone* on our coast, all known under the name of “Long Toms” by the fishermen. One species (*Belone kreftii*, Gthr.) inhabits the fresh waters of Queensland.

CLUPEIDÆ.

No less than ten species of this family inhabit the Australian waters, all of which have been recently revised and described by the Hon. W. Macleay, in vol. iv., p. 363, of ‘The Proceedings of the Linnean Society of New South Wales.’

"We will therefore only notice here those which appear to be most abundant and most likely to be useful. The 'Maray' (*Clupea sagax*) appears annually in immense shoals about mid-winter, passing in a northerly direction; and portions of the shoals sometimes enter the bays and harbours of the coast, but not certainly, as with most fishes, for the purpose of spawning, for the shoals consist at that time of small and immature fish, but probably driven in by the hosts of large fishes, porpoises, &c., by which they are invariably pursued. The same fish is seen to pass south on the eastern coast of New Zealand about six or seven months afterwards, and then they are full-grown and full of roe. The excellent bloaters of Picton, New Zealand, are made of this fish. The next best known species is the 'Herring' (*Clupea Sundaica*), a fish of great excellence and delicacy of flavour, though but little appreciated. It also appears in the winter season, and in shoals. It is said to be found about the mouth of the Hawkesbury River at all seasons of the year."—*R. R. Com.*, p. 34.

Etrumeus jacksonensis is another delicious food-fish, which is occasionally taken in the harbour. In March, 1883, both *Clupea sagax* and this species were found in good condition, and taken in the same haul of the seine.

MURÆNIDÆ.

Eels are abundant in our waters, but are only occasionally brought to the market, not being specially fished for. They are not much in demand, and seldom bring more than 6*d.* or 1*s.* each, or from 3*d.* to 4*d.* per lb. Recently there has been a slight demand, while formerly they were almost unsaleable. The species most frequently obtained are:—*Anguilla australis*, usually from the fresh-water swamps, lagoons, and rivers near Sydney; *Muræno-sox cinerea*, the "pike eel," "silver eel," &c; *Ophichthys serpens*, the sand-eel; *Conger labiata* and *Muræna afra*, the "rock" and "green" eels, which are common on all

the reefs and rocky parts of the harbours. *Muraenesox cinerea* is the largest, attaining a length of 6 feet ; it is found in tidal rivers, both in fresh and salt water. *Anguilla australis* also grows to a great size, seldom reaches 5 feet in length, but is often 10 inches in circumference ; it is a most delicious fish, and abounds in all the rivers, pools, and lagoons on the eastern watershed. Other species, as *Myrophis australis* and *Muraena nebulosa*, are sometimes taken. Eels are highly esteemed in other countries, and when our waters are properly fished they will supply largely a valuable article of food.

SCLERODERMI.

The "leather jackets," *Monacanthus*, are the only members of this family used as food, and against these even there was an undue prejudice, which is gradually dying out. *Monacanthus ayraudii* *M. hippocrepis* *M. granulatus*, Richardson, are really good table-fish, but they all require skinning before being cooked ; the young of all three species are very plentiful, and not being a marketable fish are looked upon as the reverse of useful by the fishermen. The adults of *Monacanthus ayraudii* are a serious drawback to line-fishers, especially when engaged in Schnapper-fishing, cutting the lines near the surface of the water. As our Report remarks, "unless some means can be found of getting rid of this pest, Schnapper-fishing will have to be conducted with wire lines."

CHONDROPTERYGII.

SHARKS AND RAYS.

Although the waters of Port Jackson and our coasts abound with these scavengers, but little use is made of them ; they are seldom sought for, and when occasionally

taken are seldom made use of, notwithstanding a large amount of valuable oil can be obtained from the livers, and the fins find a ready sale among the Chinese.

Dried fins of various species and samples of the oil from the livers of four of the most common kinds may be seen in the Court. The following is a list of the species found in Port Jackson, many of which attain a great size :—

SHARKS.

1. *Carcharias gangeticus*, Müll. & Henle.
2. *Carcharias macroti*, Müll. & Henle.
3. *Carcharias brachyurus*, Günther. Whaler.
4. *Galeocerdo rayneri*, McD. & Barr. Tiger-Shark.
5. *Galeus australis*, Macleay. School Shark.
6. *Zygæna leeuwinii*, Dum. Hammer-headed Shark.
7. *Mustelus antarcticus*, Günther.
8. *Lamna glauca*, Müll. & Henle. Blue Pointer Shark.
9. *Carcharodon rondeletii*, Müll. & Henle. White Pointer Shark.
10. *Odontaspis americanus*, Mitchel. Grey Nurse.
11. *Alopias vulpes*, Linn. Thrasher.
12. *Notidanus indicus*, Cuv.
13. *Scyllium maculatum*, Bl.
14. *Chiloscyllium furvum*, Macleay. Dog-fish.
15. *Crossorhinus barbatus*, Linn. Wobbegong.
16. *Heterodontus philippi*, Lacép. Port-Jackson Shark.
17. *Heterodontus galeatus*, Günther. Port-Jackson Shark.
18. *Acanthias megalops*, Macleay.
19. *Rhina squatina*, Linn. Angel Shark.
20. *Pristiophorus cirratus*, Latham. Saw-fish Shark.

RAYS.

The side fins of the Rays are used as food in many parts of the world, but, as yet, not in Australia ; even the Skates are despised as unfit for food. Notwithstanding this, they

are quite as palatable as any Skate sold in the London markets.

The following is a list of the Rays found in the harbour of Port Jackson, all of which, with the exception of *Hypnos subnigrum*, are edible :—

Rhinobatus granulatus, *Cuv.*
Trigonorhina fasciata, *Müll. & Henle.*
Hypnos subnigrum, *Dum.*
Raia lamprieri, *Rich.*
Trygon pastinaca, *Linn.*
Trygon tuberculata, *Lacép.*
Urolophus testaceus, *Müll. & Henle.*
Myliobatis aquila, *L.*
Myliobatis australis, *Macleay.*
Ceratoptera alfredi, *Kreff.*
Dicerobates, *sp.*

FRESHWATER FISHES.

PERCIDÆ, &c.

The so-called "Murray Cod" or "Macquarie Cod" (*Oligorus macquariensis*) is the largest of our freshwater fishes, sometimes weighing over 100 lbs. When at a weight of from 3 lbs. to 10 lbs. it is considered most marketable, and is without doubt a most delicious fish. It abounds in most of the rivers north of Sydney and in those of the western watershed, as the Murray and Macquarie and their numerous tributaries, affording good sport for anglers and a valuable supply of good food; they are usually taken for market with a Trammel, or Bag-net, set across the stream, or by hook and line. They have been introduced into several of the inland lakes near Sydney, such as Lake George, Lake Bathurst, &c., where they thrive remarkably well, becoming immense fish and exceedingly fat. A large

specimen, which weighed about 20 lbs., is exhibited in front of case No. 3.

Large quantities are daily, during the cold months, sent to the Melbourne and Adelaide markets from the Murray and its numerous tributaries ; the supply for the Sydney markets is obtained from Lake George and from the Macquarie River, but chiefly from the Murrumbidgee, being forwarded by train from Wagga.

Two species of Murray Cod are recognised by naturalists, the *Oligorus macquariensis*, Cuv. et Val., and *Oligorus mitchelli*, Castelnau.

The next fishes of importance, all of which are considered great delicacies, are the Golden Perch, *Ctenolates ambiguus* (*Dules auratus*, of Richardson), *Ctn. chrystii*, Cast., and *Ctn. flavescens*, Günth. *C. ambiguus* is found in considerable numbers in the Victorian fresh waters and at Wagga on the Murrumbidgee. *C. flavescens* equally plentiful, is, I believe, confined to the upper waters of the Macquarie in New South Wales ; here also we have the Silver Perch (*Therapon richardsoni*, Cast., and *T. macleayana*, Ramsay) in considerable numbers ; and although usually taken for the markets with the net, they afford good sport to the angler—from twenty to forty fine fish, weighing from $\frac{1}{2}$ to 6 lbs. weight, may easily be secured by one person in a day's fishing within a few miles of the town of Wellington.

Among other fishes equally good may be mentioned *Therapon niger*, Cast., *Murrayia guntheri*, Cast., *M. cyprioides*, Cast., *M. bramoides*, Cas., *Riverina fluviatilis*, Cast., *Macquaria australasica*, Cuv. et Val., and others which occasionally find their way into the southern markets.

Lates colonorum of Günther forms a good article of food ; it inhabits most of the rivers, lakes, and lagoons throughout

the whole of Australia, but is replaced in the northern rivers by a much larger species known as *Lates calcarifer*, which is more abundant.

L. colonorum is not unfrequently taken with nets in the bays at the estuaries of the rivers, having been brought down to the sea by the "freshes" or floods, also by "set" nets in the rivers higher up the stream. When freshly cooked they are among the best of our river fishes. They spawn during August and September, the roes being considered a great delicacy. There are many other species, such as *Lates Ramsayi*, MacLeay, *Lates curtus*, Cast., *Mugil dobula*, Gth., *Mugil argenteus*, Eels (*Anguilla australis*, the freshwater Herring (*Meletta novæ-hollandiæ*), the Cat-fish (*Copidoglanis tandanus*), and a host of small fry which afford the anglers pleasant sport as well as a good dish.

But the most important of our freshwater fishes are undoubtedly the two species of the Murray Cod (*Oligorus*), the Golden Perch (*Ctenolates*), 2 species, the Silver Perch and MacLeay's Perch (*Therapon*), the River Perch (*Lates*), 2 species, with the Eels (*Anguilla*), of which there are also probably 2 species.

EDWARD P. RAMSAY,
Commissioner of the New South Wales Fisheries.

DIVISION 46, e.

EDIBLE MOLLUSCA.

OYSTERS.

(*Ostrea glomerata*, *O. virescens*, *O. subtrigonia*, *Sow.*,
O. mordax, *Gld.*, *O. edulis*, var. *purpurea*, *Hanley.*)

A large collection of Oysters, in numerous varieties, and from beds in different localities. Most of these beds are natural beds, very few of them formed by artificial layings; all are under lease, and more or less under cultivation.

The Rock-Oysters, although usually known under several different names, are now by most conchologists admitted to be only localised varieties of one and the same species, *Ostrea glomerata*. If we accept this view, then we have only two species which are used as articles of food—*O. glomerata*, in its many varieties, and *O. edulis*, L., *O. purpurea* being only a variety of the latter, which is identical with the small form known as the "Native" in the London markets.

Ostrea sp. (No. 69), from Coffin's Bay in South Australia, is another variety of the same species found in the Adelaide market, and frequently producing irregularly formed pearls of large size but of no commercial value.

Ostrea virescens is a rare species, only occasionally found at very low tides on some of the numerous islands in Port Jackson. Other species (*O. crista-galli* and *O. imbricata*) were obtained by Mr. A. Morton at Port Denison, Queensland; and the "Hammer-head Oyster" (*Malleus albus*, Lam.), &c., are found on our coasts, but do not find their way into the market as articles of food.

The following collection, from 70 different beds and localities, is exhibited to show the numerous forms which our *Ostrea glomerata* assumes in various places, and the great

wealth which may be developed by proper legislation, administration, and cultivation of the oyster-beds in N. S. Wales.

Recent experiments tend to prove that the Rock-Oyster of our shores (Nos. 10, 28, 40, 67), which is left dry by every tide, is only a variety of the Drift-Oyster ; and spat taken from the rocks at low tides, when laid in beds always covered by the sea, are said to thrive well ; and although Oysters may thrive on natural beds of *mud and sand*, whenever these beds are over-dredged the animals become diseased by the infiltration of mud into the shells. Steamer traffic over the shallow water-beds of the Hunter River, formerly so prolific, has in many cases either deteriorated or completely destroyed them (see examples of this in specimens No. 63). The black mud stirred up by steamer traffic, and brought down by the tides or "freshes" in the river, has infiltrated into the shell ; the animal, unable to get rid of it, has deposited a layer of nacre over it time after time, until the shell has become formed of thin layers of mud and nacre, and the animal becomes exhausted, diseased, and dies. That natural Oyster-beds can and are, in fact, being destroyed daily by over-dredging, and by traffic when situated in shallow waters, in other countries as well as in Australia, must be patent to any one who has taken the trouble personally to examine into the subject. It is also clear, from the numerous specimens exhibited from our waters, that the depth up to 10 or 15 feet is not material, although the best Oysters are obtained from the shallowest beds, and are grown on a rough shelly, gravelly, or stony bottom. The most highly prized in New South Wales are those from the rocks or beds where the fresh and salt water mingles at certain seasons of the year ; for instance, at the estuaries of the river and vicinity of fresh-

water creeks (see specimens No. 10). The value of Oysters in Sydney is from 4s. to 10s. per bushel, and are retailed at 6d. to 1s. per dozen.

Those who are desirous of obtaining further information on this subject will do well to consult the Reports of the Royal Commission on the (Oyster) Fisheries of N. S. Wales, 1877, 1880, &c., and the 'Proceedings of the Linnean Society of New South Wales' for the last two or three years (1881 to 1883), where several interesting Papers will be found on the subject by Dr. J. C. Cox, F.L.S., the Rev. J. E. Tenison-Woods, F.L.S., and Mr. John Brazier, C.M.Z.S.

Newcastle Oysters, Hunter River.

- No. 1. From the main channel known as the Bluff Bed : depth of water from 1 to 24 feet.
2. From the Beaton Bed ; depth of water from 4 to 15 feet.
3. From the western side of the Channel ; part of it becomes dry at low water ; the deepest part of it is about 8 feet.
4. From the western side of the Channel : part of it becomes dry at low water ; the deepest part of it is 5 feet.
5. Is from the first bed in Fulerton Cove on the east side of the Bay ; depth of water from 1 to 20 feet.
6. Is from the next bed on the west side of the Channel ; depth of water from 6 to 15 feet.

Hawkesbury-River Oysters.

- No. 7. From Browera Creek. Natural "Dredge Oysters." Length of bed 10 miles, 4 to 8 or 10 feet wide, with depth of water 4 feet in some places, at others from 10 to 12 feet at low water.
8. From "Muna Muna" Creek. Cultivated Oysters, laid on an artificial bed, under cultivation, at the entrance, in Feb. 1882, have improved very well ; depth of water 5 feet at low water.

9. Cultivated Oysters, laid in March 1882 on a bed, at the entrance to Mooney Creek, in 3 feet of water at low water, have not done so well.
10. The very best Rock-Oysters ; *dry at low water*, very scarce, and bring the highest price in the market when obtainable.

Manning-River Oysters.

- No. 11. From Harriett's Bed ; 100 yards long and 10 to 12 yards broad ; depth of water 8 feet. This bed is now completely exhausted, the bottom being of black muddy sand ; destroyed by over-dredging.
12. From Blackbutt's Bed ; 150 yards long and 10 to 12 yards wide ; depth of water 12 to 20 feet ; bottom same as above.
From mouth of Graham's-Creek Bed ; 150 yards long, 4 to 8 yards wide ; depth of water 4 to 8 feet.
14. From Lee's Bed ; 300 yards long, 60 to 70 yards wide ; depth of water 5 to 12 feet ; rocky bottom, irregular.
15. From Owen Smith's Back Bed ; 300 yards long, 60 yards wide, depth 4 to 12 feet ; bottom very rocky and irregular.
16. From Shubert's Bed ; 300 yards long, 70 yards wide, depth 2 to 12 feet.
17. From P. Smith's Bed ; 300 yards long, 10 to 20 yards wide, depth 4 to 20 feet.
18. From Scott's Creek Bed ; 250 yards long, 20 yards wide, depth 2 to 10 feet ; rocky bottom.
19. From Catton Bed ; length 200 yards, breadth 60 yards ; depth of water from 3 to 20 feet ; bottom—sand, clay, and mud.
20. From McDermid's Bed ; length 500 yards, breadth from 50 to 60 yards ; depth of water from 5 to 16 feet ; bottom rocky.

Clarence-River Oysters.

- No. 21. From the House Bed ; depth of water 3 feet.
22. From the House Bed ; depth of water 6 feet.

23. From the House Bed ; depth of water 17 feet. The House Bed is the most important of the Clarence-River Oyster-beds.
24. From Rotgut Bed ; depth of water 3 feet.
25. From Rotgut Bed : depth of water 16 feet. The Oysters from this bed have had an indifferent reception in the market, and the bed has accordingly received its peculiar name. The bed was well worked last year (1881), and it is supposed that it is on this account that the Oysters are this season (December 1882), for the first time free from the objectionable defect from which the bed takes its name.
26. From Captain Dick's Bed ; depth 4 to 6 feet in the Lake Channel ; with an area of about $3\frac{1}{2}$ acres ; and produces the best quality of Oysters.
27. From the Mud Patch , depth 12 to 14 feet. It is a small bed, interrupted in places with mud patches, hence its name.
28. Rock-Oysters, taken from the stones on the inner side of the dyke at the Clarence Heads.
29. From Brodie's Bed ; depth 3 to 6 feet.
30. From Brodie's Bed ; depth 16 feet. Contains an area of about 8 acres.
31. From Lake Bed, which covers an area of 7 acres, and is said to have been one of the finest beds in the Clarence River ; several portions of it have been covered by shifting sand ; depth of water 8 to 4 feet.

Moruya-River Oysters.

- No. 32. The Beds extend about half a mile on each side of the river, and are covered with from 8 to 12 feet of water.

Shoalhaven-River Oysters.

- No. 33. Bed 300 yards from the mouth of Broughton Creek, and about 200 yards long ; depth of water from 10 to 16 feet ; rocky bottom.

- 34. Bed about 400 yards from Broughton Creek ; about 150 yards long ; depth of water 12 feet ; rocky bottom.
- 35. Bed about 100 yards long ; depth of water from 7 to 14 feet ; rocky bottom.

Fervis-Bay Oysters.

- No. 36. Currumbene Creek , the bed is about 2 miles from the mouth of the Creek ; about 150 yards long ; depth of water from 5 to 10 feet ; rocky bottom.
- 37. Currumbene Creek ; bed about 300 yards from the above-mentioned bed ; about 200 yards long ; depth of water from 5 to 12 feet ; rocky bottom.
- 38. From Bherrewerre ; the length of the bed is about 200 yards ; depth of water from 4 to 9 feet ; rocky bottom.

Crookhaven-River Oysters.

- No. 39. Bed worked out ; depth from 6 to 8 feet ; bottom, shells.
- 40. Rock-Oysters from the Dyke, Crookhaven River.

George's-River Oysters.

- No. 41. O'Connell's Oyster-Bed dredging-ground ; length of bed about 400 yards, width about 40 yards ; depth of water 10 to 20 feet.
- 42. Oven-Reach Bed ; about 20 chains long ; width of bed about 25 yards ; depth of water 20 to 30 feet.
- 43. Punt-Reach Bed ; about 150 yards long, width about 20 yards ; depth of water about 10 to 15 feet.
- 44. "Big Half-Moon Bed ;" about 100 yards long, width about 20 yards ; depth of water about 20 to 25 feet.

Richmond-River Oysters.

- No. 45. Known as the Upper Bed ; dredged from the depth of 7 feet.
- 46. Taken from a mud-flat left bare at low water.
- 47. Rock-Oysters taken from the rock at the Pilot Station, Richmond-River Heads.

Clyde-River Oysters.

- No. 48. Sample from 14 to 20 feet depth of water ; bottom shelly and shingly.
49. Sample from 25 to 35 feet depth of water ; bottom, hard slaty bed with large loose rock.
50. Sample from 12 to 20 feet depth of water ; bottom gravel and shell.
51. A hard rock-bed with large loose stones ; depth of water about 40 feet.
52. Soft shingly rock-bed of a yellow colour ; depth of water about 14 to 20 feet.
53. Shell and shingly bed, with a rocky shore ; depth of water about 20 feet.
54. Hard rocky bottom ; depth of water about 60 feet.
55. Hard slaty-rock bed ; very few shells ; depth of water about 40 feet.
56. Soft yellow-rock bed ; no shingle ; depth of water from 14 to 20 feet.

Camden-Haven Oysters.

- No. 57. "Stinker's Creek ;" depth of water 6 to 10 feet, with pipe-clay and ironstone bottom covered with oyster-shells and sandy mud.
58. Lower Bed, Maine River ; depth of water 10 to 13 feet, with broken shells and sandy mud bottom.
59. Middle Bed, Maine River ; depth of water 6 to 10 feet, with shells and sandy mud bottom.
60. Known as the upper or top bed, Maine River.
61. The upper or top bed, Maine River ; depth of water from 6 to 9 feet, with oyster-shells and silty bottom.

Lake-Tuross Oysters.

- No. 62. TRUE MUD-OYSTER.

Ostrea edulis, Linn., var, *purpurea*, Hanley ; *O Angasii*, Sowerby.

*Sample of Newcastle Oysters, being destroyed by steam traffic
in the river.*

- No. 63. These oysters are being destroyed by the large quantity of silt spreading over the natural Oyster-bed ; they only live a few days after being taken from the water, and even when freshly-opened the animal is of a dirty-white colour, and quite unfit for food.

Cape-Hawke Oysters.

- No. 64. This is the so-called Drift Oyster of the Sydney Oystermen
Ostrea subtrigona of Sowerby.
An overgrown form of *Ostrea glomerata*, Gld.

Lake Cutgee, near Bermagui.

- No. 65. TRUE MUD-OYSTER.
Ostrea edulis, Linn., var. *purpurea*, Hanley : *O. Angasii*,
Sowerby.

Auckland, New Zealand.

- No. 66. ROCK-OYSTER.
Ostrea glomerata, Gld.

Cape Upstart, Queensland.

- No. 67. ROCK OYSTER.
Ostrea mordax, Gld. Variety of *Ostrea glomerata*, Gld.

- No. 68. THE TRUE MUD-OYSTER.

Ostrea edulis, Linn., var. *O. purpurea* (Hanley);
O. Angasii (Sowerby).
From Port Jackson.

- No. 69. A variety of the MUD-OYSTER (*O. edulis*, L.), from the South Coast of Australia, about 130 miles west of Adelaide, near Coffin's Bay ; hard limestone bottom, no mud.
This variety produces pearls, but of no commercial value,
(Obtained from Messrs. Taylor Brothers, Adelaide.)

No. 70. *OSTREA VIRESCENS*, *Angas*.

A rare species found at very low tides on some of the small islands in Port Jackson. (From Mr. Brazier's collection.)

COLLECTION OF OTHER EDIBLE MOLLUSCA.

1. *Haliotis nœvosa*, *Mart*.

The "Mutton-fish," or Ear-shell as it is sometimes called, was once very abundant on our coast, and is still plentiful on certain unfrequented parts. It is considered a great delicacy by the Chinese, by whom it is chiefly used, and worth from 10d. to 1s. per lb.

1 *a*. Animal dried; 1 *b*. Animal dried and salted; 1 *c*. The shell as used for making ornaments, &c.

2. *Ninella straminea*, *Mart*.

Found under ledges of the rocks at low water, and still tolerably plentiful in the neighbourhood of Port Jackson. With other shellfish they formed one of the chief articles of food in the early days of the aborigines, and are still eaten by some of the colonists; when boiled slowly or steamed for a considerable time, the animal becomes soft and is easily extracted from its shell. The shells are used for ornaments when polished, and in the manufacture of buttons. Zoologists may be interested in the fact that a small parasitic crustacean is sometimes found imbedded in the integument of this species.

3. *Trochocochlea tæniata*, *Q. et G*.4. *Tectarius pyramidalis*, *Quoy*.5. *Littorina mauritiana*, *Lam*.

These, known under the name of "Periwinkles," are occasionally eaten, being sold in the streets to the juvenile

members of the community. They are found in considerable numbers on the rocky shores all along our coasts.

6. *Potamides ebeneum*, Brug.

This is a much larger animal than any of the preceding, and, although frequently eaten, is more often used as bait by amateur fishermen. It abounds on the extensive mud and sandy flats of Port Jackson and other inlets of the coast, and may be gathered in quantities at low tides.

7. *Triton australis*, Lam.

Formerly plentiful in crevices under shelving rocks on the seaboard. Seldom used as food, perhaps from its scarcity. It is a fine handsome shell, and attains comparatively a large size.

8. *Mytilus hirsutus*, Lam.

This bivalve, frequently known as the "Mussel," is found in large quantities, growing together in masses on the rocky shores often left dry by the tides, but also at a considerable depth. When roasted it has much the same flavour as an oyster treated in the same way, and is esteemed by many people. It may be cooked in a variety of ways, as clams are in America.

9. *Anomalocardia trapezia*, Desh.

Usually known as "Clams," &c.; this species is quite equal to the well-known clam of America. It is to be regretted that it is not more in use as an article of food in the colonies. Numbers may be taken by trawling over the sandy flats at the mouths of the Hunter and Paramatta rivers, &c., or at low tides by wading among the sea-grass (*Zostera*) nearer the shore.

10. *Tapes undulata*, *Born.*

This species is not often used as an article of food in the colonies, although allied species are usually eaten in other countries. A very small species of an allied genus found at Alexandria is used at Aden and Port Said as a common article of food.

11. *Tridachna elongata*, *Lam.*

This species is common on the reefs on Lord Howe's Island, and is palatable and nutritious. Like the "Clam," it may be cooked in a variety of ways.

12. *Chione calophylla*.

This species is only obtainable by dredging or trawling, unless baited traps be used. While evidence is wanting as to its use as an article of food, being probably not found in sufficient numbers, there is no reason to doubt its usefulness in this way. It was formerly much sought after by conchologists, being a very ornamental species and somewhat rare; lately, however, it has been found comparatively plentiful at the mouth of the Paramatta river and Lane Cove, on a black-mud bottom.

13. *Ostrea virescens*, *Angas.*

It is to be hoped that no naturalist would have the hardihood to break open the shell of so rare a species for the sake of the delicious morsel contained therein. *Ostrea virescens* is only found at very low tides on certain islands in Port Jackson. The specimens have been obtained from Mr. John Brazier, C.M.Z.S., who has also been good enough to furnish the scientific names of the shells mentioned in the foregoing collections, *according to the latest version by conchologists.*

DIVISION 54, n.

GROUP OF AUSTRALIAN EARED SEALS.

Arctocephalus (Otaria) cinereus, Péron. *Adults, male and female, and young ones.*

There are two, if not three, species of seals still frequenting the New South Wales coast. The largest, called the sea-leopard, *Stenorhynchus leptonyx*, is the rarest, being only occasionally found after severe gales, and then generally in a dead or dying condition. Some of these animals attain the length of from 10 to 14 feet. The skin would make good leather, but it is of no value for its fur, and being so seldom found cannot be looked upon as of any commercial value.

The more common species, *Otaria cinerea*, Péron, which a few years ago was so rapidly becoming extinct that it was found necessary to have them protected by Government, is now happily on the increase, and a fine herd of this beautiful species still inhabits the "Seal Rocks," a little north of Port Stephens. With respect to this species Professor J. W. Clark, of Cambridge, has kindly sent me the following note :—

Otaria cinerea. Péron.

"This species was first determined by Péron, whose 'Voyage aux Terres Australes' was published in 1810. He brought home no specimens; but a skull, collected at Port Western by MM. Quoy and Gaimard in 1830, was considered by them to represent Péron's species. This skull is now in the Museum at Paris, and may be regarded as the type of the species. The skull of the male exhibited in the New South Wales Court has been compared with it,

and the two are certainly identical. It is the first time that the animal has been seen in England."

An interesting account of the seal fisheries formerly carried on in the Australian colonies will be found in Mr. A. W. Scott's valuable work on seals and whales.

SIRENIA.

Halicore australis. THE DUGONG. *Male and female.*

A fine pair of these curious creatures*, with oil and lard extracted from their flesh, samples of the skin and hide, and salted meat from the same animals.

The oil is nutritious and in great demand for medicinal as well as culinary purposes, being considered superior to cod-liver oil by many medical men; it is pleasant to the taste, resembling fresh olive-oil, and perfectly colourless when pure, becoming opaque and white with cold below 65° F.

The food of the Dugong consists of sea-grasses, chiefly a species of *Zostera*, which grows luxuriantly on the sandy mud-flats at the mouth and estuaries of rivers, and in the shallow bays along the coast. They are still plentiful all along the north-east coast, and extend their wanderings as far south as Moreton Bay, where at one time they were also plentiful; and they have been occasionally observed as far south as the Tweed and Richmond rivers; but this is now of rare occurrence. The colour of the living animal varies in tints of very light olive-brown above, the belly being of a pale flesh-colour; when dead the colour of the back becomes lighter, the olive tints fading away. Some specimens, notably two

* The animals have been carefully cured and beautifully mounted by Mr. E. Spalding, late of Sydney, now Taxidermist in the Brisbane Museum, Queensland.

(male and female), taken March 1874 at Rockingham Bay, were, when dead, of a uniform dull flesh-colour, and measured respectively 8 and 10 feet ; but as a rule the male is the larger.

In its habits, actions, and movements in the water the Dugong closely resembles the Manatus. Some few years ago dugong-fishing was carried on with much energy in Moreton Bay, Wide Bay, and also in the vicinity of Rockhampton, &c., where these grotesque mammals were then abundant. Of late years, however, they have become so scarce that the fisheries have been abandoned, and the species thus saved for a time from being exterminated.

Dr. Hobbs, of Brisbane, who has studied the Dugong from a commercial point of view more closely than any one else in the colonies, was the first to bring the nutritive and medicinal qualities of the oil prominently before the public ; his numerous Papers and valuable pamphlets published on the subject at various times, extending over a period of many years, testify to the large amount of labour, skill, and ability expended thereon.

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